

REMARKS

Favorable reconsideration and of this application in view of the foregoing amendments and remarks to follow are respectfully requested.

Before addressing the specific grounds of rejection raised in the outstanding Office Action, Applicants have cancelled Claims 4, 11, 12, and 22. Applicants have amended Claim 1 to positively state that an Al layer is present atop a TiN layer and that a clean/pretreatment is performed on said Al layer prior to forming said Ni/Au metallization. Support for this amendment is found in the cancelled Claim 9 and paragraphs [0044] – [0047] of the instant application. Claim 8 has been amended to reflect the changes in Claim 1 and to positively recite the Al layer. Applicants have added new Claims 23 – 35. Support for newly added Claims 23 – 26 is found in paragraphs [0044] – [0047] of the instant application. Support for newly added Claims 27 – 33 is found in Claims 1 – 3, 5, 6, 8, and 21 prior to the present amendments and throughout the specification. Support for newly added Claims 34 and 35 is found in paragraphs [0044], [0053] – [0057]. Since all elements of the amendments are supported by the specification, entry of the amendments is respectfully requested.

In the Office Action dated February 13, 2007, Claims 1-6, 8, 11, 12, 21 and 22 stand rejected under 35 U.S.C. § 103(a) as allegedly obvious over U.S. Patent No. 6,451,681 to Greer (hereinafter “Greer”) in view of U.S. Patent Application Publication No. 2005/0032348 to Farnworth et al. (hereinafter “Farnworth”). Claim 9 stands rejected under 35 U.S.C. § 103(a) as allegedly obvious over Greer in view of Farnworth, and further in view of U.S. Patent No. 4,696,098 to Yen (hereinafter “Yen”). Claim 10 stands rejected under 35 U.S.C. § 103(a) as

allegedly obvious over Greer in view of Farnworth, and further in view of U.S. Patent No. 6,174,823 to Dobson, et al. (hereinafter "Dobson").

In the outstanding Office action, the Examiner stated that Greer-Farnworth both fail to explicitly disclose a metallic cap (that) comprises an Al layer that is cleaned/pretreated prior to forming the Ni/Au (page 5, lines 21 – 22). The Examiner alleged that it is well known in the semiconductor industry to substitute Ti (titanium) for Al (aluminum) and cited Yen (col. 3 lines 39 – 45).

Applicants submit that currently amended Claim 1, which is equivalent to cancelled Claim 9, is patentable. While the Examiner alleges that Ti and Al are equivalent for the purposes of the present invention, Applicants submit that a Ti surface and an Al surface are not equivalent for the purposes of the present invention, particularly as a surface on which Ni is to be electroplated. This is because Ti is more cathodic (noble) than Ni, and Ni is more cathodic than Al, in a series of metals that is known as the "Galvanic series" in the art of electroplating. As is well known in the art, to be able to electrolessly plate a metal, the metal needs to be more noble, or more cathodic than another metal onto which the metal is electrolessly plated. In other words, for Ni to be electroplated, the underlying surface must be less noble (more anodic, or less cathodic). While Ni may be electrolessly plated on Al in most cases, Ni may not be electrolessly plated on Ti unless the surface of Ti is activated, i.e., become more cathodic than Ni by surface preparation.

Applicants submit three web page printouts to support the above statement. The first web page printout is from <http://www.corrosion-doctors.org/Definitions/galvanic-series.htm> as captured at 12:35 p.m. on April 16, 2007. The second web page printout is from <http://www.mcnallyinstitute.com/charts/galvanic-series.html> as captured at 12: 36 on April 16,

2007. The third web page printout is from http://en.wikipedia.org/wiki/Galvanic_Series as captured at 12:26 p.m. on April 16, 2007. All three web page printouts make it clear that Ni is more noble than Al, and thus Ni may be electrolessly plated over Al in principle, electroless plating of Ni on a Ti surface requires modification of surface properties to enable electroless plating of Ni. Thus, Al and Ti are not identical for the purposes of electrolessly plating Ni, as described and claimed in the instant application.

Applicants note that Yen does not teach or suggest any electroplating or electroless plating. While Al and Ti may be interchangeable for some other applications involving electroplating or electroless plating, in applications in which the galvanic series determines the reaction of metal such as electroplating of Ni on a metal surface, Al and Ti are not equivalent as described above. Since Yen does not consider any electroless plating applications, considering Ti and Al as equivalent metals in applications that employ electroless plating would be erroneous.

For the purposes of electroplating of Ni, as described and claimed in the instant application, Greer-Farnworth and Yen do not have the same environment of integrated circuit metallization since Greer-Farnworth and Yen does not provide clean/pretreatment of an Al surface.

Further, Applicants submit that the Examiner's assertion that Greer-Farnworth discloses a metallic cap made (of) Ti layer that is cleaned/pretreated prior to forming the Ni/Au (col. 3, lines 50 -67 and col. 4, lines 1 – 58) is not supported by Greer or Farnworth. Applicants submit that col. 3, line 50 – col. 4 line 58 of Greer does not disclose any clean or surface treatment. In fact, the only surface treatment or clean that the combination of Greer, Farnworth, and Yen is an argon plasma clean of preplated bumps prior to wirebonding mentioned in Farnworth.

Applicants observe that the argon plasma clean is for the purpose of wirebonding, and not for the purpose of electroless plating.

Thus, the combination of Greer, Farnworth, and Yen does not teach or suggest, among other things, a step in which a clean/pretreatment is performed on said Al layer prior to forming said Ni/Au metallization. Thus, Applicants submit that amended Claim 1, and all dependent claims therefrom, including Claims 2, 3, 5, 6, 8, 21, 23 – 26 are patentable.

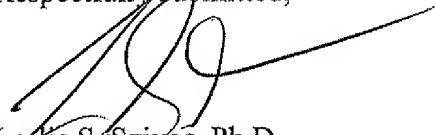
Applicants submit that new Claims 27 – 35 are also patentable. Concerning cancelled Claim 10, the Examiner stated in the outstanding Office Action that “Greer and Farnworth both fail to disclose (a method) wherein the Ti layer of the metallic cap is activated prior to forming the Ni/Au metallization.”

In the same Office Action, the Examiner alleged that Dobson discloses activating a Ti layer prior to depositing another metal layer to the surface of the TiN/Ti layer. Applicants submit that this interpretation of Dobson is erroneous since Dobson clearly specifies “reactivation of the barrier layer” in col. 2, lines 56 – 57 and the barrier layer is identified as a “barrier layer of Titanium Nitride” in col. 2, lines 55 – 56. Further, col. 8 line 54 – 57 specifies “exposing the surface of the titanium nitride layer to activated nitrogen so that any free surface titanium in the titanium nitride layer is nitrified to form the barrier layer” (emphasis added by Applicants). In addition, col. 9, lines 7 – 9 of Dobson states “depositing a barrier layer of titanium nitride on the workpiece; reactivating the barrier layer.” Therefore, it is clear that a TiN surface is activated according to Dobson, and that activation of a Ti surface is not taught or suggested by Dobson. Therefore, Dobson does not disclose activating a Ti layer. clean/pretreatment of a Ti surface is therefore not taught or suggested by Dobson as well.

Therefore, activation of a Ti surface or clean/pretreatment of a Ti surface is not taught or suggested by any of Greer, Farnworth, and Dobson. As such, Applicants submit that new Claims 27 – 35 are patentable.

Applicants submit that the claims as amended are patentable. Accordingly, prompt examination and allowance thereof is respectfully requested. Should the Examiner determine that anything further is desirable to place this application in even better form for allowance, the Examiner is invited to contact the undersigned at the telephone number indicated below.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'LS', with a long horizontal line extending to the right.

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